

ASPECTS OF VOYAGER PHOTOGRAMMETRY

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In January 1986, Voyager 2 took a series of pictures of Uranus and its satellites with the Imaging Science System (ISS) on board the spacecraft (Smith et al., 1986). Based on six stereo-images from the ISS narrow-angle camera, a topographic map was compiled of the southern hemisphere of Miranda, one of Uranus' moons (Fig. 1). Assuming a spherical figure, a 20-km surface relief is shown on the map. The images used were FSC268-4611, -4614, -1617, -4626, and -4629. With three additional images (FSC268-4409, -4413, and -4630) from the ISS wide-angle camera, a control network of Miranda's southern hemisphere was established by analytical photogrammetry, producing 88 ground points for the control of multiple-model compilation on the AS-11AM analytical stereoplotter.

The calibrated focal lengths of the wide-angle and narrow-angle cameras on board the spacecraft are, respectively, 200.77 mm and 1,503.49 mm (Davies et al., 1979). Each frame of the two cameras consists of 800 x 800 image elements with a pixel size of 14)m. Both cameras have a grid of 202 reseau marks. Calibration of reseau coordinates has an accuracy of better than 2)m (Benesh and Jepsen, 1978). Residuals of images produced from the Optronics Photowrite range from 8 to 17)m. Decalibration was made by the U.S. Geological Survey image-processing facility in Flagstaff, using reseau calibration data. For the control network, coordinate measurements were further corrected by a second-degree polynomial. Residuals of measurements were then reduced to 6 to 8)m, about half an image element. Images used for map compilation were obtained at altitudes ranging from 30,000 to 42,000 km. Control-network adjustment has a precision of about 375 m.

Digital terrain data from the topographic map of Miranda have also been produced. By combining these data and the image data from the Voyager 2 mission, perspective views or even a movie of the mapped area can be made.

The application of these newly developed techniques to Voyager 1 imagery, which includes a few overlapping pictures of Io and Ganymede, enables the compilation of contour maps or topographic profiles of these bodies on the analytical stereoplotters.

References

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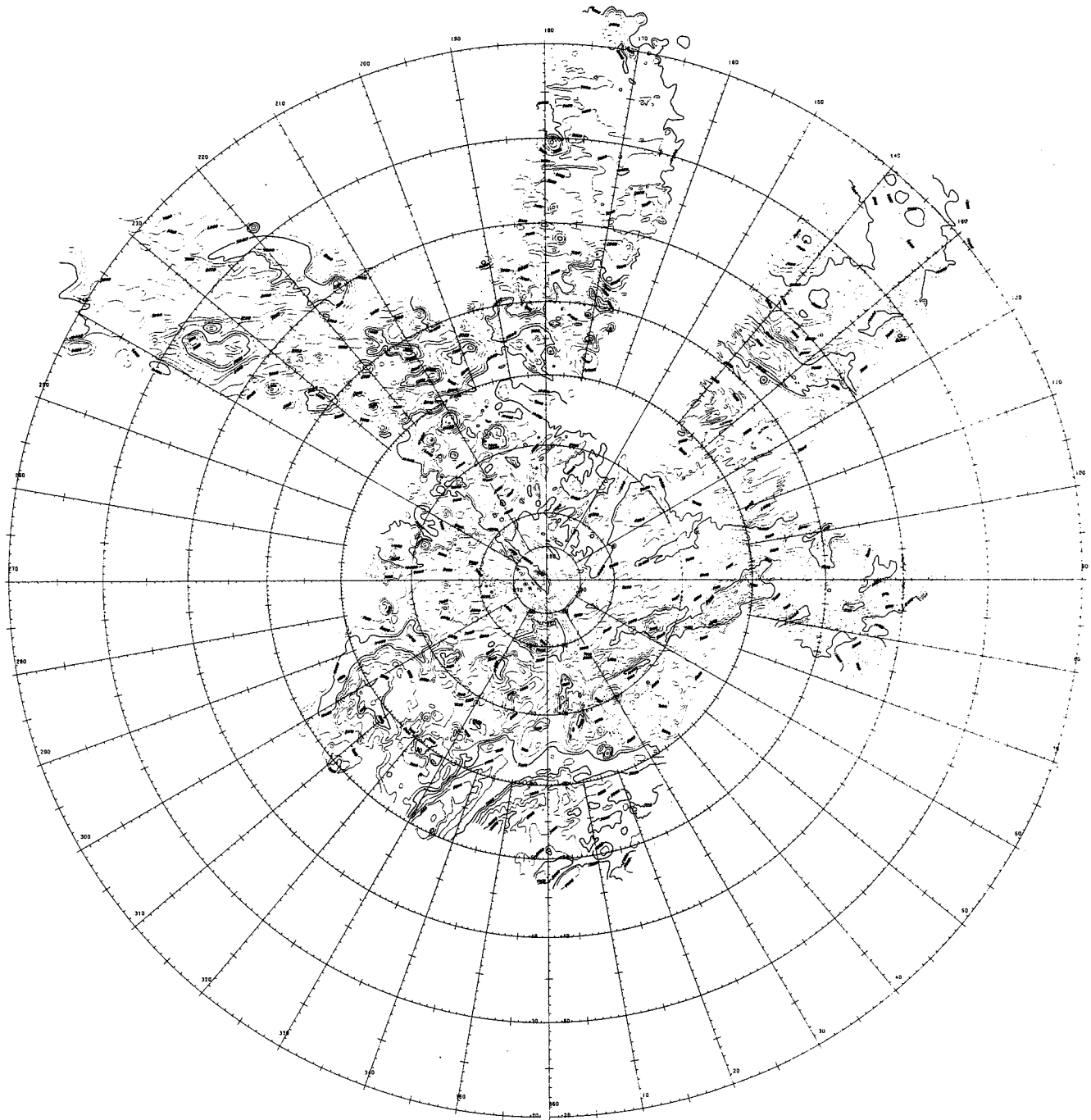


Figure 1. Topographic map of the southern hemisphere of Miranda, one of Uranus' satellites. Compilation scale is 1:1 million and contour interval is 1,000 m. The projection is Polar Stereographic.